REMARKS

Claims 1-4 and 6-8 remain pending in the application, with Claims 1 and 8 being independent. These claims are believed to be allowable for the reasons discussed below.

Initially, Applicants' undersigned representative wishes to thank the Examiner for the courtesies extended during the personal interview of November 5, 2009. During the interview, the rejections under 35 U.S.C. § 112 and 35 U.S.C. § 103 were discussed. It was agreed that no further claim amendments were necessary at this time. A summary of the discussion during the interview and response to the rejections of record follow.

Claims 1 and 8 were rejected under 35 U.S.C. § 112, first paragraph, as allegedly failing to comply with the written description requirement. The Office Action suggested that no specific and sufficient support for several claimed features was provided in the last response. Support for the specific features noted by the prior Examiner will be discussed below.

The Office Action questioned support for counting a number of reading operations for reading out printing data from a print buffer and calculating a read address in accordance with the number of reading operations counted. As discussed during the interview, support for this feature can be found in the specification at least at page 22, lines 13-27 and page 23, line 5 to page 24, line 10. In this passage, reading and counting are specifically discussed.

The Office Action further questioned support for the head parameter unit storing information for each of the various types of printheads, and the parameter unit driving a selected printhead. As discussed during the interview and at page 4, line 14 to page 5, line 9, some conventional circuits are configured so as to simultaneously access data at a plurality of addresses in order to efficiently access the memory in accordance with the printheads' specifications. This is a drawback in that the conventional control circuit limits the

specifications of a compatible printhead. The present invention can solve this drawback by allowing printheads with various arrangements to use a common control circuit in a serial printer. One of ordinary skill in the art would recognize that there are many types of available printheads for a printer, but the claimed printing apparatus can allow any one of these printheads to be mounted therein and still be operable. At least at page 19, lines 19-24, the specification discusses that information including the number of colors for printheads, the number of nozzles of each printhead, etc., are stored in the register of the head parameter unit 4. Thus, in view of the drawback of the conventional art discussed above, as well as the disclosure of the invention, one of ordinary skill in the art would read the claimed head parameter unit as storing information on various types of printheads. Further, this information is used for driving the printheads.

The Office Action further questioned support for storing information on an interval of adjacent printing elements of concurrently drivable printing elements. In the present invention, the interval can be a first interval between "01" and "81", a second interval between "81" and "161", and a third interval between "01" and "161". As discussed during the interview, referring to Figure 10, "adjacent" can be construed to mean the shortest or closest interval between printing elements of concurrently drivable printing elements. In Figure 10, the claimed interval would be between "01" and "81" or between "81" and "161", which are the closest concurrently drivable elements. During the interview, Applicants' undersigned representative offered to change the term "adjacent" to --closest--. However, the Examiner indicated that the meaning of the terms in question was clear and no further changes were necessary.

Thus, Applicants submit that the present invention is adequately described in the specification. Reconsideration and withdrawal of the § 112, first paragraph, rejection are requested.

Claims 1 and 8 were rejected under 35 U.S.C. § 112, second paragraph, as allegedly being indefinite. The Office Action suggested that it is unclear what is the number of reading operations for reading out the printing data. Applicants respectfully submit that such terminology would be understood by one of ordinary skill in the art. Nevertheless, such terminology will be further described below. The printing apparatus of the present invention assumes distributive driving of a plurality of printing elements in the printhead. As discussed previously, at page 19, lines 19-24, the specification describes that the register of the head parameter unit stores information (the number of colors for printheads, the number of nozzles of each printhead, the divisional driving number, etc.). Accordingly, the claimed printhead is driven according to distributive driving. For a single cycle of driving the printhead, the printhead is driven a number of times, which number is a value obtained by dividing the number of nozzles of each head by the divisional driving number. Each time the printhead is driven, the printing data is read out from a buffer memory. The reading operation recited in the claims is synchronized with the printhead distributed driving. Therefore, the claimed number of reading operations is the same as the divisional driving number. Thus, Claims 1 and 8 particularly point out and distinctly claim what Applicants regard as their invention. Reconsideration and withdrawal of the § 112, second paragraph, rejection are requested.

Claims 1-4 and 6-8 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Takemura et al. (U.S. Patent No. 6,341,843) in view of Kato et al. (U.S. Patent No. 6,009,845) and Applicants' "admitted prior art." This rejection is traversed.

An important feature of the present invention is, upon reading out printing data stored in a buffer memory, based on information on a number of concurrently drivable printing elements according to distributive driving for each of various types of printheads, an interval of adjacent

printing elements of the concurrently drivable printing elements of each of the various types of printheads, and a number of a plurality of printing elements of each of the various types of printheads stored in a head parameter unit for driving selected printheads of the various types of printheads to calculate a read address of the buffer memory in accordance with a number of concurrently drivable printing elements in distributed driving for a selected printhead, an interval of adjacent printing elements of the concurrently drivable printing elements, a number of a plurality of printing elements of the selected printhead, and a counted number of reading operations for reading out the printing data from a buffer memory. With such a feature, the printing apparatus can flexibly utilize a buffer memory for a printhead, which is attached to a carriage, selected from plural different types of printheads, which are available or acceptable to the printing apparatus. This is because a read address for the buffer memory can be calculated in accordance with a number of concurrently drivable printing elements in distributed driving of the selected printhead, an interval of the closest or adjacent printing elements of the concurrently drivable printing elements of a selected printhead, a number of a plurality of printing elements of the attached, selected printhead, and a counted number of reading operations for reading out the printing data from a buffer memory to perform time-divisional driving. That is, any desired printhead from the various types of available printheads can be driven according to the number of concurrently drivable printing elements and the number of the plurality of printing elements. Thus, the number of available or acceptable printheads is increased.

An example of an application of the present invention, without limiting its scope, is described below. Referring to page 24, lines 11-20, assume the number of printing elements in a printhead is 24, the number of concurrently drivable printing elements is 3 (e.g., nozzle 1, nozzle 9, and nozzle 16), and an interval of the closest or adjacent printing elements of the concurrently

drivable printing elements is 8. Further, a counter is initially set to be 0, as described at page 22, lines 15 and 16. In this case, every ninth nozzle is concurrently driven, and a buffer memory is accessed at every ninth address. Printing data is read out from addresses 0, 8, and 16 of the buffer memory corresponding to the initially concurrently driven printing elements (nozzle 1, nozzle 9 and nozzle 16) as described at page 22, line 17 to page 23, line 19. After this reading operation, the counter counts up by 1 so that the counter value becomes 1. Next, printing data is read out from addresses 1, 9 and 17 corresponding to concurrently driven printing elements (nozzle 2, nozzle 10, nozzle 17). The counter then counts up by 1 and becomes 2. The reading operations are repeated until the reading of printing data from addresses 7, 15 and 23 is completed and the counter value becomes 8. Refer also to Figure 10. Furthermore, as discussed at page 24, lines 23-25, a printhead in which every fifth nozzle is concurrently driven can be accepted, and in such case, the buffer memory is accessed every fifth address.

Takemura et al. describes an inkjet printhead that includes a printer buffer 139 and a printhead, which can store printhead identification information in an EPROM. While Takemura et al. may control driving based on a fixed number of concurrently drivable printing elements, there is no discussion of the number of concurrently drivable printing elements in distributed driving and the interval of adjacent printing elements of the concurrently drivable printing elements. Applicants respectfully submit that Takemura et al. does not disclose or suggest anything with regard to a head parameter unit or a parameter storage step, as is recited in independent Claims 1 and 8. That is Takemura et al. does not disclose or suggest at least storing information on a number of the concurrently drivable printing elements according to distributed driving for each of the various types of printheads, an interval of adjacent printing elements of the concurrently drivable printing elements of each of the various types of printheads, and a

number of a plurality of printing elements of each of the various types of printheads, as is recited in independent Claims 1 and 8. Applicants submit that in Takemura et al. any available printhead must be driven according to a fixed number of concurrently drivable printing elements and the apparatus of Takemura et al., therefore, cannot accept various types of printheads, which may differ in the number of concurrently drivable printing elements.

Thus, Takemura et al. fails to disclose or suggest important features of the present invention recited in independent Claims 1 and 8.

Kato et al. describes a serial printer that can store print data into a buffer based on the number of nozzle arrays and a number of nozzles. As discussed previously, and during the interview, Kato et al. is not directed to the use of various types of printheads. Kato et al. does not disclose or suggest storing the information on a number of concurrently drivable printing elements, an interval of adjacent printing elements of the concurrently drivable printing elements and a number of a plurality of printing elements. Kato et al., therefore, fails to remedy the deficiencies of Takemura et al. noted above with respect to the independent Claims.

Thus, Claims 1 and 8 are patentable over the citations of record. Reconsideration and withdrawal of the § 103 rejection are requested. Dependent Claims 3, 4, 6 and 7 are also allowable, in their own right, for defining features of the present invention in addition to those recited in their respective independent claims. Individual consideration of the dependent claims is requested.

Favorable reconsideration and withdrawal of the rejections set forth in the above-identified Office Action and an early Notice of Allowability are respectfully requested.v

Applicants' undersigned attorney may be reached in our Washington, D.C. office by telephone at (202) 530-1010. All correspondence should continue to be directed to our address given below.

Respectfully submitted,

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